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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/791,030	03/01/2004	Xinye Liu	40004551-0011-002	1253
26263 7590 09/23/2009 SONNENSCHN NATH & ROSENTHAL LLP P.O. BOX 061080 WACKER DRIVE STATION, WILLIS TOWER CHICAGO, IL 60606-1080				
EXAMINER				
ZERVIGON, RUDY				
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1792				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/791,030

**Applicant(s)**

LIU ET AL.

**Examiner**

Rudy Zervigon

**Art Unit**

1792

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 July 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 56, 61, 64-68, 70, 75 and 76 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 56, 61, 64-68, 70, 75 and 76 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 56, 61, 64-68, 70, 75 and 76 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. Claim 56 recites the limitations “a second purge gas flow line”, “low conductance gas flow pathway”, and “high conductance gas flow pathway” in claim 56. There is insufficient antecedent basis for these limitations in the claim.
4. Claims 56, 61, 64-68, 70, 75 and 76 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: How are the claimed piping arrangements “placed in parallel”? Is this in the geometric sense? This is assumed below.

***Claim Rejections - 35 USC § 103***

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
6. Claims 56, 61, 70, 75, and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watabe; Masahiro (US 5500256 A) in view of Sasaoka; Tatsuo et al. (US 6949144 B2). Watabe teaches an atomic layer deposition (ALD) apparatus (Figure 2; column 4; lines 40-65), comprising: a reaction chamber (12; Figure 2; column 4; line 43) having a wafer support (14;

Figure 2; column 4; lines 40-65) disposed therein, said reaction chamber (12; Figure 2; column 4; line 43) being coupled downstream of a set of ALD chemical precursor sources<sup>1</sup> (gas sources/IDs of 18b,d; Figure 2) and a first purge gas flow pathway (holding 18a; Figure 2; column 4; lines 40-65) said reaction chamber (12; Figure 2; column 4; line 43) being coupled upstream of a pumping (19; Figure 2) arrangement (22, 19; Figure 2; column 4; lines 40-65) that includes a controllable flow conductance<sup>2</sup> (22; Figure 2; column 4; lines 40-65) and a pump (19; Figure 2); and a second purge gas flow line (holding 18c; Figure 2; column 4; lines 40-65), independent of the chemical precursor sources<sup>1</sup> (gas sources/IDs of 18b,d; Figure 2), placed in parallel<sup>3</sup> with the ALD chemical precursor sources<sup>1</sup> (gas sources/IDs of 18b,d; Figure 2) through a gas distribution apparatus (11; Figure 2;) disposed within the reaction chamber (12; Figure 2; column 4; line 43) - claim 56. Applicant's claim requirements of "an atomic layer deposition (ALD) apparatus", "purge gas" are claim requirements of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

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<sup>1</sup> No "ALD" chemicals are identified in Applicant's as-filed specification other than "A" or "B" or nitrogen , argon, helium - [0047]-[0048], [0053], and Kr, Xe - [0078].

<sup>2</sup> In this context "conductance" is an attribute of the "flow pathway" and is thus used here as an adjective. Conductance = volumetric flow rate across flow element / change in pressure across flow element. See Aral at column 6; lines 41-58.

<sup>3</sup> Assumed to be in the geometric sense. See 112 rejection.

Watabe further teaches:

- i. The ALD apparatus (Figure 2; column 4; lines 40-65) of claim 56, wherein the controllable (21,25; Figure 2) flow conductance (22; Figure 2; column 4; lines 40-65) is switchable from a first state (on/off/values in between) to a second state (on/off/values in between), as claimed by claim 61
- ii. The ALD apparatus (Figure 2; column 4; lines 40-65) of claim 56, wherein the controllable (21,25; Figure 2) flow conductance (22; Figure 2; column 4; lines 40-65) is switchable under the control of a controller (21; Figure 2) to switch states (on/off/values in between) according to a difference in residence times for passage of gas between (i) upstream gas sources (gas sources/IDs of 18b,d; Figure 2) and the reaction chamber (12; Figure 2; column 4; line 43), and (ii) the reaction chamber (12; Figure 2; column 4; line 43) and the controllable (21,25; Figure 2) flow conductance (22; Figure 2; column 4; lines 40-65), as claimed by claim 70. Sensor 20 is a pressure sensor whose value directly corresponds to the claimed difference in residence time. When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).
- iii. The ALD apparatus (Figure 2; column 4; lines 40-65) of claim 56, wherein the controllable (21,25; Figure 2) flow conductance (22; Figure 2; column 4; lines 40-65) is switchable under the control of a controller (21; Figure 2) to switch states (on/off/values in between) to maintain a nominally constant ratio between (i) gas flow pathway conductances upstream of the reaction chamber (12; Figure 2; column 4; line 43), and (it)

gas flow pathway conductances downstream of the reaction chamber (12; Figure 2; column 4; line 43) during both exposure and purge periods of an ALD cycle, as claimed by claim 75. Sensor 20 is a pressure sensor whose value directly corresponds to the claimed difference in residence time. When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

- iv. An atomic layer deposition (ALD) apparatus (Figure 2; column 4; lines 40-65), comprising: a reaction chamber (12; Figure 2; column 4; line 43) having a wafer support (14; Figure 2; column 4; lines 40-65) disposed therein, said reaction chamber (12; Figure 2; column 4; line 43) being coupled downstream of a set of ALD chemical precursor sources<sup>1</sup> (gas sources/IDs of 18b,d; Figure 2) and a first purge gas flow pathway (holding 18a; Figure 2; column 4; lines 40-65), and said reaction chamber (12; Figure 2; column 4; line 43) being coupled upstream of a pump stack (19; Figure 2) that includes a controllable (21,25; Figure 2) flow conductance (22; Figure 2; column 4; lines 40-65) and a pump (19; Figure 2); and a second purge gas flow line (holding 18c; Figure 2; column 4; lines 40-65), independent of the chemical precursor sources<sup>1</sup> (gas sources/IDs of 18b,d; Figure 2) – claim 76. Applicant's claim requirements of "an atomic layer deposition (ALD) apparatus", "purge gas" are claim requirements of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (*Walter* , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus

claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Watabe does not teach “an inert gas source”. As such Watabe does not teach that Watabe’s independent purge gas flow line (holding 18c; Figure 2; column 4; lines 40-65) *being placed downstream from an inert gas source* through both low conductance (17b; Figure 2;) and high conductance (17a; Figure 2;) gas flow pathways – claim 56.

Watabe does not teach “an inert gas source”. As such Watabe does not teach said second purge gas flow line (holding 18c; Figure 2; column 4; lines 40-65) being placed downstream *from an inert gas source* through both low conductance (17b; Figure 2;) and high conductance (17a; Figure 2;) gas flow pathways and being fed to the pump stack (19; Figure 2) below the reaction chamber (12; Figure 2; column 4; line 43) – claim 76.

Sasaoka teaches a similar gas distribution system and piping (All upstream of 8A; Figure 8) including an inert gas source (“Ar”; Figure 8)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Sasaoka’s inert gas source to the apparatus of Watabe.

Motivation to add Sasaoka’s inert gas source to the apparatus of Watabe is for process preparation as taught by Watabe (column 1; lines 22-30).

7. Claims 64-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watabe; Masahiro (US 5500256 A) and Sasaoka; Tatsuo et al. (US 6949144 B2) in view of Sakai;

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Hiroyuki et al. (US 5070813 A). Watabe and Sasaoka are discussed above. Watabe and Sasaoka do not teach:

- i. The ALD apparatus (Figure 2; column 4; lines 40-65) of claim 56, wherein the controllable (21,25; Figure 2) flow conductance (22; Figure 2; column 4; lines 40-65) comprises a throttle valve, as claimed by claim 64
- ii. The ALD apparatus (Figure 2; column 4; lines 40-65) of claim 64, wherein the throttle valve comprises an annular throttle valve located within the reaction chamber (12; Figure 2; column 4; line 43), as claimed by claim 65
- iii. The ALD apparatus (Figure 2; column 4; lines 40-65) of claim 65, wherein the annular throttle valve includes multiple vanes, each having an axis therethrough, as claimed by claim 66
- iv. The ALD apparatus (Figure 2; column 4; lines 40-65) of claim 65, wherein the annular throttle valve includes multiple blades arranged in an iris configuration, as claimed by claim 67
- v. The ALD apparatus (Figure 2; column 4; lines 40-65) of claim 65, wherein the annular throttle valve includes multiple blades, each having a number of holes therethrough, at least one of the blades being rotatable about an axis such that holes extending through the rotatable blade align with holes of at least one of the other blades to provide a passage through the annular throttle valve, as claimed by claim 68

Sakai teaches a coating apparatus including an iris throttle valve (10, 11; Figure 1, 2) located downstream from Sakai's chamber 1, Figure 1 for controlling reactor chamber pressure (19, 20; Figure 1). Sakai further teaches:



- i. The deposition apparatus (Figure 1) wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple vanes (10; Figure 2), each having an axis therethrough, as claimed by claim 66
- ii. The deposition apparatus (Figure 1), wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple blades (10; Figure 2) arranged in an iris configuration (Figure 2), as claimed by claim 67
- iii. The deposition apparatus (Figure 1) of claim 65, wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple blades (10; Figure 2), each having a number of holes (a; Figure 2) therethrough, at least one of the blades (10; Figure 2) being rotatable about an axis such that holes (a; Figure 2) extending through the rotatable blade align with holes (a; Figure 2) of at least one of the other blades (10; Figure 2) to provide a passage through the annular throttle valve (10, 11, Figure 1,2), as claimed by claim 68

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Watabe's variable conductance valve (22, Figure 2; column 4; lines 50-60) with Sakai's iris valve.

Motivation to to replace Watabe's variable conductance valve (22, Figure 2; column 4; lines 50-60) with Sakai's iris valve is for reproducing the exhaust rate "with high reproducibility" as taught by Sakai (column 1; lines 53-57).

#### ***Response to Arguments***

8. Applicant's arguments with respect to claims 56, 61, 64-68, 70, 75, and 76 have been considered but are moot in view of the new grounds of rejection.

***Conclusion***

9. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Friday schedule from 9am through 5pm. The official fax phone number for the 1792 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435

/Rudy Zervigon/

Primary Examiner, Art Unit 1792